

Claims

1. A method for filling pores (2) between two adjacent layers (1', 1'') of a laminate for a component with high demands upon strength and comprising several layers of fibre composite having within each layer substantially parallel fibres (5) embedded into a matrix (6), in which at least said two adjacent layers have fibre directions differing substantially, which comprises the steps:
 - 10 a) a connection path, through which a medium may move inside the laminate, is created between the exterior of the laminate and the pore,
 - 15 b) a flowing, curable material is applied at one outer surface of the laminate and brought to fill the pore through said connection path, and
 - 20 c) the material filling the pore is brought to cure,
characterized in that in step a) said connection path is created by exerting the laminate at least in the region of said pore to forces making slots (4) propagating substantially in the matrix through each laminate layer along the fibre direction of the layer.
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2. A method according to claim 1, **characterized** in that in step a) said laminate is cooled at least in the region (3) of said pore (2) to a sufficiently low temperature so as to make the matrix material between said fibres to contract that much that said slots (4) are created along the fibres.
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3. A method according to claim 2, **characterized** in that in step a) the cooling is carried out to a temperature below -70°C, preferably below -150°C.
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4. A method according to claim 2 or 3, characterized in that in step a) it is cooled by applying liquid nitrogen or carbon dioxide snow on the laminate.
5. 5. A method according to any of claims 2-4, characterized in that a region (3) of the outer surface of the laminate right in front of said pore (2) is restricted and in step a) cooling medium is applied on the laminate only within the restricted region.
10. 6. A method according to claim 1, characterized in that in step a) said connection path is created by exerting the laminate to such outer forces in planes transversal to the fibre direction of the layers of the laminate that slots (4) propagate through each layer along the fibre direction of the layer.
15. 7. A method according to claim 6, characterized in that the forces applied in step a) are maintained during step b) so as to act to open the slots (4) and facilitate transport of the flowing material to the pore (2) and that after the filling said forces are removed before the curing in step c) for automatically pressing superfluous flowing material out of the slots.
20. 8. A method according to any of the preceding claims, characterized in that directly before and/or in connection with step b) the laminate is at least in the region of said pore (2) heated to a temperature necessary for making said flowing material to be a thinly fluid.
25. 9. A method according to any of the preceding claims, characterized in that in step b) outer forces are applied on the laminate in planes transversally to the fibre directions of the different layers so as to open said slots (4) when applying the flowing material on the outer surface of the laminate for facilitating the transport of the flowing material to said pore (2).
30. 35.

10. The method according to any of the preceding claims, characterized in that in step b) a negative air pressure is applied on the laminate on the opposite side thereof with respect to the outer surface of the laminate on which the flowing material is applied so as to facilitate the transport of the flowing material into the laminate through the slots (4).
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11. The method according to any of the preceding claims, characterized in that it is carried out on a laminate with
10 layers of carbon fibre epoxy.
12. The method according to any of claims 1-10, characterized in that it is carried out on a laminate with layers of glass fibre polyester.
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13. The method according to any of the preceding claims, characterized in that in step b) an epoxy glue is applied as said flowing, curable material.
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14. The method according to claims 8 and 13, characterized in that said heating is carried out to a temperature exceeding +40°C.
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15. The method according to any of the preceding claims, characterized in that it is carried out on a laminate in which the fibre direction of the respective layer makes an angle of 30 – 90° with the fibre direction of adjacent layers.
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16. The method according to any of the preceding claims, characterized in that it is carried out on a laminate having a thickness of each individual layer between 0,05 and 0,2 mm.
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17. The method according to any of the preceding claims, characterized in that it is carried out on a laminate composed by 4 – 200 superimposed said layers.

18. The method according to any of the preceding claims, characterized in that it is carried out for filling said pores having an area of at least 36 mm².
- 5 19. The method according to any of the preceding claims, characterized in that one or more pores are filled for a component for a flying vehicle or a space craft.